

The heliocentric system from the Orphic Hymns and the Pythagoreans to emperor Julian

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Abstract. The evolution of the heliocentric theory in the antiquity has been analyzed, from the first seeds in the Orphic Hymns to the emperor Julian, also called "the Apostate" in the 4th century A.D. In particular the Orphic Hymns, views of Pythagoreans, as well as the heliocentric ideas of Philolaus of Croton, Ictetas, Ecphantus, Heraclides of Pontos, Anaximander, Seleucus of Seleucia, Aristarchus of Samos and Emperor Julian were analyzed.

Key words: Heliocentric system, Orphic Hymns, Pythagoreans, Philolaus, Anaximander, Aristarchus, Emperor Julian

Хелиоцентричната система от орфическите химни и питагорейците до император Юлиан

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Проследено е развитието на хелиоцентричната теория в античността, от орфическите химни до император Юлиан, наричан в IV в сл.н.е. още "изменникът". Анализирани са, в частност, орфическите химни, възгледите на питагорейците, както и хелиоцентричните идеи на Филолаус от Кротон, Икетас, Екфантус, Хераклидес от Понтос, Анаксимандер, Селеукус от Селеуция, Аристархус от Самос и император Юлиан.

Introduction

Ever since early antiquity, philosophers and astronomers had been preoccupied with the question concerning which of the heavenly bodies occupied the center of the known world. The geocentric system, in accordance with its egocentric formulation, placed our small planet in the center of the world, a notion that seemed to fit the egocentric minds of the wise. Enjoying the favor of the majority of the philosophers and astronomers, it dominated for centuries. However, there were also opposite views in favor of the heliocentric theory. Indeed, even before Aristarchus the Samian, seeds of the heliocentric theory can be traced back to the Orphic Hymns and in the teachings of Anaximander and the Pythagoreans. Later on Aristarchus the Samian founded the heliocentric theory, which unfortunately did not prevail, unlike its geocentric adversary which gained wide recognition, initially due to the weight of Aristotle's views, and later on due to those of the great astronomer Claudius Ptolemy (2nd century A.D.).

Yet the heliocentric system had not been entirely forsaken. During the 4th century A.D., emperor Julian -also called "the Apostate"-, the last emperor of the first Byzantine dynasty, became a fervent supporter. Julian held the Earth as a planet which, like all other planets, went around the sun in a circular orbit. Thus, Aristarchus' theory had not been forgotten during the first centuries A.D., but even enjoyed advocacy.

1 Orphic Hymns

The ancient teachings of Orpheus are considered to be the first mystic Greek religion, with poems and hymns of great beauty. The Orphic Hymns consist of 87 hexametric poems or 1200 verses in total, which have reached us under the title "*Hymns of Orpheus to Musaeus*".

The hymns contain a breadth of astronomical information, partly obscured by the use of a strongly poetic language, as well as interesting ideas for the creation and the supreme being. This last piece of information tells us that the hymns belong to a monotheistic cult, since the creation of the Universe is ascribed to a single supreme force. We also come across the interesting notions of Chaos and the cosmic egg, which led to the creation of "Phanes", he who is radiant and existent.

*From eyes obscure thou wip'st the gloom of night, all-spreading splendour,
pure and holy light. Hence Phanes call'd, the glory of the sky,
on waving pinions thro' the world you fly.*

[V. TO PROTOGONUS, *The Fumigation from Myrrh*, verse 15
(see e.g. *Orphic Hymns sine datum*, or *Orphicorum Fragmenta*, 1922)]

Nearly all of the ancient Greek sages and writers drew inspiration from themes found in the Orphic Hymns, and were thus influenced while formulating their unique theories and teachings.

Let it be noted that in the Orphic Hymns, "Chaos" stands for what nowadays we would call space, "Gaia" for the earth-mother (and not the planet) whereas "Eros" (love), stands for the creational force. In the same hymn, we find a praise to Chaos which spans the aether, and was born from the cosmic egg:

*O Mighty first-begotten [Protogonos], hear my pray'r, two-fold, egg-born, and
wand'ring thro' the aether...*

[V. TO PROTOGONUS, *The Fumigation from Myrrh*, verse 1]

Let it also be noted that during the Homeric times, the Earth was perceived as a circular flat disk which was surrounded by a vast circular river, the Ocean. This notion is made evident in the following verse:

*Old Ocean [Okeanos] too reveres thy high command, whose liquid arms
begirt the solid land.*

[X. TO PAN, *The Fumigation from Various Odors*, verse 15]



Fig. 1. Phanes: God of light, truth and justice. Here he appears to be surrounded by an elliptical (egg-shaped) ecliptic with the zodiacal signs of the four basic elements. Above and below him are the two halves of the cosmic egg, and between them, lies a flaming Phanes, winged just like the creative Eros. In his right hand he holds thunder (like Zeus does) and a scepter in his left, signifying his kingly place on the world. The curled snake on him symbolizes the Earth, the cup stands for water, the wings for air and the torch for fire. Its legs are shaped like a fork, just like those of the god Pan.

The hymns mention Heaven being the ruler of the world, revolving around the Earth:

Great Heav'n [Ouranos], whose mighty frame no respite knows... Hear, world ruler,..., forever whirling as a sphere around this earth
 [III. TO HEAVEN: *The Fumigation from Frankincense*, verse 1]

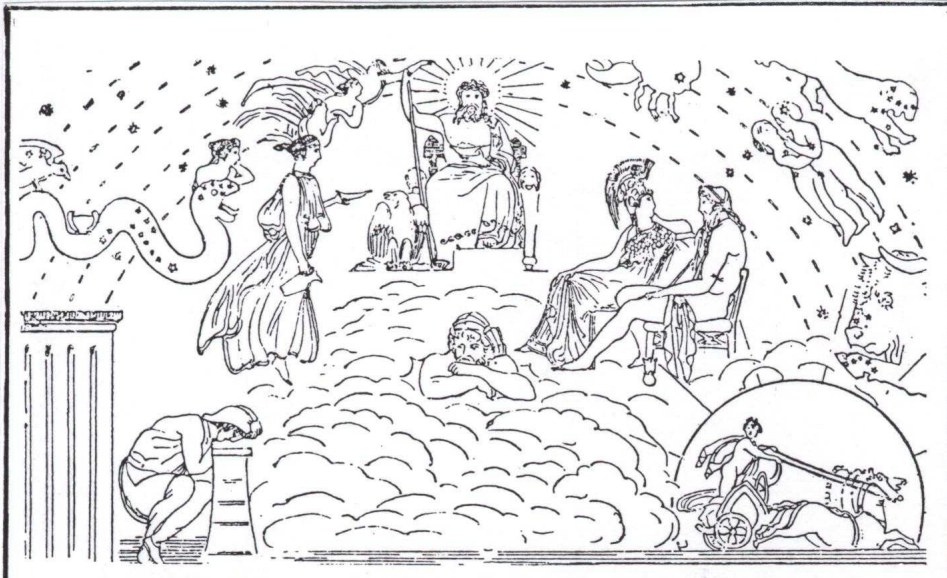


Fig. 2. The Homeric Universe: In the Universe of Homer's times, the mountains can be seen to rise over the surface of the great disk of the Earth, the Ocean spreading around them, while the center is dominated by Mount Olympus which rises up to heaven. In its highest peak, the all-seeing Zeus is seated, supervising both immortal gods and mortal men, sometimes rewarding and sometimes punishing them. Beyond Olympus spreads Heaven, supported by the pillars of Atlas. In heaven we can locate the Moon, the stars and the constellations. In particular, in this figure we can distinguish -but not referred by Homer- the constellations of Hydra, Corvus, Crater, Cancer, Leo, Gemini, Taurus as well as the Pleiades open cluster (as cited in D. Cotsakis, 1976, p. 18)

Another verse suggests that the origins of the heliocentric system seem to be located in the Orphic Hymns, as has been previously stressed by Constantinos Chassapis (1967), the late Greek astronomer, and Maria Papatathanassiou (1978, 1980), assistant professor in the Mathematics Faculty at the University of Athens:

*Hear golden Titan! Glowing like gold, you who strides above, oh heavenly light...
 ... you who combines the epochs ... You are the world ruler...
 With your golden lyre, draw on the harmonious path of the world...
 ... [you] who wanders through fire and moves around in a circle
 [VIII. To the Sun, verse 2]*

The phrase "[you who attracts] draw on the harmonious path of the world" is striking since this could be a spermatic idea of the harmonious movement of the planets around the Sun, a notion which was commonly used during at least the first five (perhaps more) centuries B.C. If the planets are to be included in the notion of the world, then the golden Sun could be seen as

the attractive center of their harmonious orbits. One may therefore make the assumption that the seeds of a heliocentric theory can be traced in the Orphic Hymns.

Furthermore, on hymn (34): To Apollo, we find the following:

Loxias, the pure! ... You mixed in equal parts winter and summer...
[XXXIV. To Apollo, verse 6,... and 20]

Thus, the "Loxias" Sun (meaning "tilted") mixed the components of the year and divided it in two equal parts, the summer and the winter. This is a very important astronomical detail which has drawn some attention from the astronomical community, because it has been linked to the dating of the Orphic Hymns. If one were to view this information literally, he would look back in time when the summer and winter were of exactly equal length. This would place the Orphic Hymns -more or less- near the following dates: 1841 B.C. and 1366 B.C. (Chassapis, 1967 and Papathanassiou, 2003). This view however, requires the assumption that ancient Greece possessed very capable astronomers in early antiquity, an idea with little evidence to support it.

Another excerpt which, although referring to Hestia, seems to add to the heliocentric aspect of the hymns, is Hymn (84) [To Hestia]

You who occupies the center of the home of the greatest and eternal fire.
[LXXXIV. To Hestia, verse 2]

In *Orphicorum Fragmenta* a fragment tell us about the rotation of the Earth. This fragment says that Musaeus knew the path of the star and the movement of the sphere around the Earth, as this round Earth revolves in equal time period around its axis (Fr. 247 v. 24-26, pp. 261-262).

2 The Pythagoreans

Pythagoras founded his School at Croton in lower Italy, in c.540 B.C. He and his followers held the view that the most important cosmological principle were the numbers. In a way they were not mistaken, since it is in numbers that today's scientific thought is focused, for numbers identify with mathematical harmony and, without them, science would have never existed in the first place.

The Pythagorean School placed the foundations for the philosophy of mathematics as well as for physics, by relating order and the harmony of sound to the harmony of the Universe.

Virtually all of the students of Pythagoras were trained in astronomy, but their studies of the motion and the distances of the planets were carried out with a rather mystical approach. They believed in mystical and sacred relations between the numbers and the phenomena that they describe. In the Pythagorean view, the planetary distances were analogous to a heavenly musical harmony, which was created by harmonious sounds. They believed that this harmony was constantly created, being an eternal expression -of the highest order- of the unique divine harmony.

The Pythagoreans would have been delighted to see ideas very similar to their own, used in contemporary science. For example, modern String theory holds that everything on a microscopic level is a combination of vibrating strings. The Pythagoreans, developers of the "music and harmony of the spheres", would have seen particles as microscopic strings whose rhythmical vibrations create other particles, i.e. "the musical notes". These notes, in turn, create the music of the heavenly spheres. Thus though their eyes, our whole world would seem like a musical symphony, composed with these notes.

Pythagoras' School was a brotherhood, most likely in an almost religious sense, had various degrees of initiation, and may have been founded after the manner of the Orphic communities. Its contribution to geometry, music, arithmetic and astronomy was integral for the evolution of scientific thought. Through geometry, as well as the harmony of sound and numbers, the Pythagoreans developed the notion of perfection in the Universe, and coined an appropriate word to describe it: "Cosmos". This name is derived either from the word "cosmo" which means "to orderly arrange" or from the word "cosmema" which means "jewel" (ornament). Pythagoras himself appears to be the first to use the word "Cosmos", according to the doxographer Aetius: "*Pythagoras was the first to name the place of all things Cosmos, due to its orderly nature*" [Aetius, *De Vestutis Placitis*, II, 1, 1 (D. 327, 8)]

The Pythagorean School held that the essence of all things was the "number", a rather abstract notion, which could not be perceived through one's senses, but only through intellect. In this manner, the philosophers of this school equated infinity with those material elements which could not be subject to measurement or definition. They introduced the notion of "matter", which was perceived as an element that resisted every definition of its ontological and moral imperfection.

Some elements of the Pythagorean cosmology have reached us through one of Aristotle's books, namely *Metaphysics*. According to the Pythagoreans, the Cosmos was created after the "One" initially came into being. The "one" -or "en" in Greek- served as the first principle, attracted the "infinite" (apeiron) to its own self, and bestowed on it with the "limit" (peras). These last two notions, the "limit" and the "infinite" have no clear meaning, but it has been speculated that they could be referring to the prime and even numbers.

Aristotle also mentions the following: "*The elements of number, according to them, are the Even and the Odd. Of these the former is limited and the latter unlimited; Unity consists of both (since it is both odd and even) [note of trans: either because by addition it makes odd numbers even and even numbers odd (Alexander, Theo Smyrnaeus) or because it was regarded as the principle of both odd and even numbers (Heath)]. Number is derived from Unity; and numbers, as we have said, compose the whole sensible universe*" [Aristotle, *Metaphysics*, A5, 986, 15]

Aristotle provides us with a further comment on the Pythagorean ideas: "*It is absurd also, or rather it is one of the impossibilities of this theory, to introduce generation of things which are eternal. There is no reason to doubt whether the Pythagoreans do or do not introduce it; for they clearly state that when the One had been constituted -whether out of planes of superficies or seed or of something that they cannot explain- immediately the nearest part of the Infinite began to be drawn in and limited by the Limit [note of trans:*

if numbers are eternal, it is absurd that they should be generated]. [Aristotle, *Metaphysics*, 1091a, 14].

Another cosmological notion that the Pythagorean School of thought held was that the Creation began from a unique single point, which continuously expanded to infinity. It is evident that the Pythagoreans believed that the Universe evolved from a spherically expanding infinitesimal core. This idea once again, has been shared by some astronomers, who believe in a static spherical universe whose existence began from an initial point.

Another idea that Pythagoras believed in was that the Earth was spherical and immobile in the center of the Cosmos, which was spherical as well. "*..the water, earth and air; these elements interchange and turn into one another completely and combine to produce a universe animate, intelligent, spherical, with the earth at its center, the earth itself too being spherical and inhabited round about*" [Diogenes Laertius, *Lives of Eminent Philosophers*, VIII, 25, 8-10].

Many Pythagoreans held an identical view of a spherical Earth, placed in the center of the world, *without being supported by anything*. This was a novel idea in its time, and is demonstrative of a clear progress when compared to assumptions that were previously held by other Greek philosophers.

According to the late professor of astronomy, Demetrios Kotsakis, "Pythagoras was the first who taught that the apparent motion of the sun on the celestial sphere from the east to the west, could be analyzed in to two distinct motions: One daily from East to West, parallel to the equator, and one yearly from West to East on the ecliptic" (Kotsakis, 1976, p. 28).

In the 6th century B.C., some students and followers of Pythagoras, and most importantly Philolaus of Croton, Heraclides of Pontus, Ephantus of Syracuse as well as others, believed in a "pyrocentric" theory. This means that they accepted that the element of fire was the "first principle" of the Cosmos. They believed that after the Creation, the element of fire accumulated in the center of the Cosmos and its attraction to its neighboring parts was part of the creation, formation and formulation of the various bodies that made up the spherical Universe.

2.1 The ideas of Philolaus of Croton

Philolaus of Croton (450-500 B.C.), spread the pythagorean ideas concerning the "first principle", by organizing and writing a synopsis of pythagorean philosophy. It appears that he was the principle creator of the philosophical notions of the "limit", the "infinite" and the harmony between the two, which, according to his views, was achieved due to the "number". He believed that the Cosmos is unique and began its creation from the center, which was occupied by fire. There, he placed the "Anticthon", (or Counter-earth - a hypothetical invisible Earth), the Earth, the Moon, the Sun, the five planets known at the time (Mercury, Venus, Mars, Jupiter and Saturn), and the sphere of the fixed stars. Thus, ten heavenly bodies "danced" around the central fire, a number which the Pythagoreans held as sacred. It has been speculated that the Anticthon was introduced exactly for this reason, namely to raise the number of the celestial bodies to the sacred number ten.

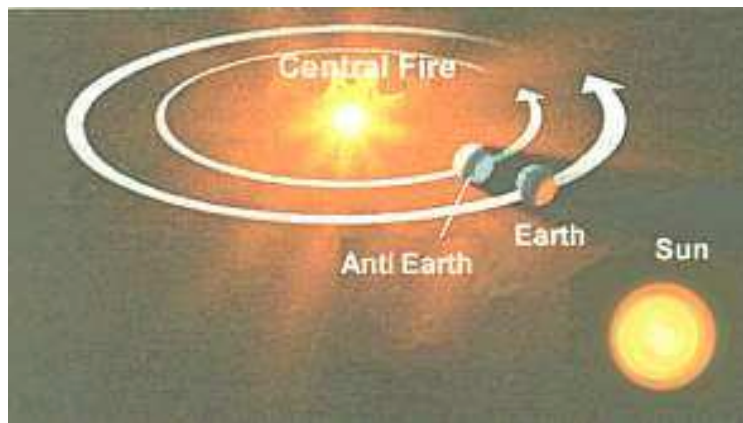


Fig. 3. Pythagorean Universe

It is told that Philolaus of Croton, along with Archippus, Lysis and few others, survived the revolt against the Pythagoreans in Croton, which was instigated by Cylon, an ex student of Pythagoras, who had been sent off from the school for failing to comply with its principles. It is certain that the teachings of Pythagoras and his students, their innovative theories, their mysticism, as well as their aristocratic political tendencies caused the violent reaction of their democratic adversaries, who either killed or exiled many of them: "*Cylon of Croton... and those allied with him, hunted (killed) the Pythagoreans down to the man.*" (Iamblichus *Vita Pythagorii* (V.P.) 248-249 ff).

Following this course of events, Philolaus left Croton and based himself in Thebes, where he taught Pythagorean philosophy and wrote the books *Bachae* and *On Nature* A, B and C (Cosmos, Nature and Soul respectively). An extant fragment from his first book reads: "*The world is uniform, it began its creation from the center, and from the center it expanded uniformly upwards and downwards, keeping equal distances from the center*" (Diels and Kranz, 1996, *Die Fragmente der Vorsokratiker*).

Several sources provide information on some of his cosmological thoughts: *The initial One, the beginning of the creation of the Universe, is called Hestia* [*On Nature*, fragment 7, Stobaei *Eclogae* I 21, 8 (p. 189, 17 W)].

Diogenes Laertius mentions: *According to Demetrius, in his work "on men of the same name", Philolaus was the first to publish pythagorean treatises, to which he gave the title "On Nature", beginning as follows: Nature in the ordered universe was composed of unlimited and limiting elements, and so was the whole universe and all that is therein* [Diogenes Laertius, *Lives of Eminent Philosophers*, 85 (A1 I 398, 20)].

The doxographer Aetius (Aet. I 3, 10), informs us (citing Theophrastus) of the following: *Philolaus believes that there is fire around the center of the Universe, which he calls "hestia of all" and "house of Zeus", "mother*

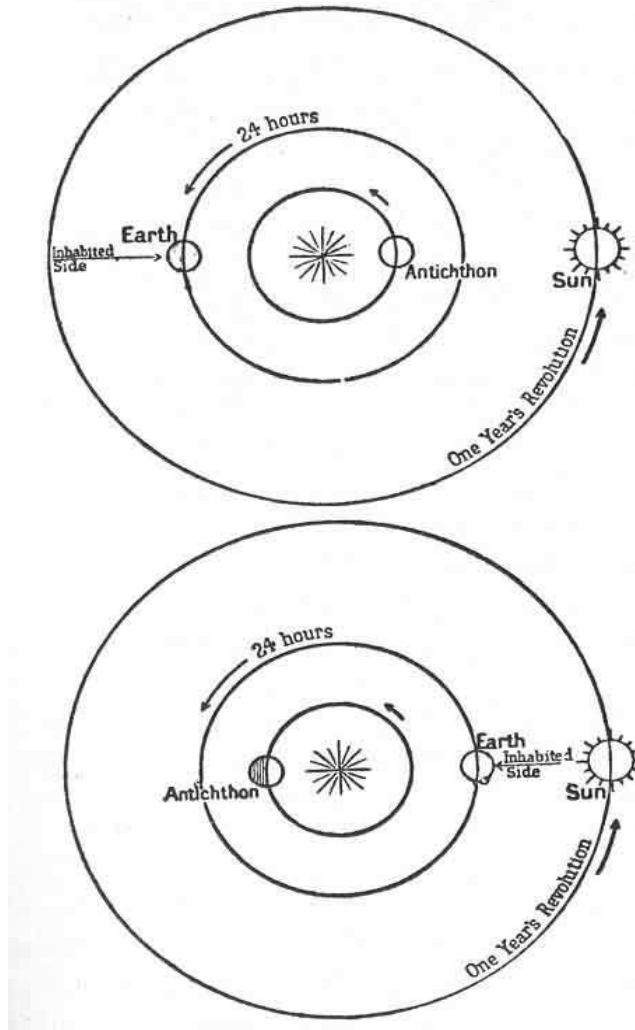


Fig. 4. Antichthon: The hypothetical invisible Earth, which according to the Pythagoreans occupied the antipodes of the Earth.

of the Gods”, “altar, constraint and measure of nature”. There is another fire which dwells in the outer region of the Universe. The center, he says, came first by nature, and around it dance ten heavenly bodies: The sphere of

fixed stars, then the five planets, then the Sun, then the Moon, followed by the Earth and Anticthron, and after all these the fire of "hestia", which lies around the center. The outer region, which surrounds the whole Universe, is a place where the elements are in their pure state, unmixed, and that place he calls "Olympus". All that lies beneath Olympus, namely the part where the five planets along with the Sun and the Moon lie, he calls "cosmos", while the area beneath those, the sublunar space . . . he calls "heaven". Wisdom is relevant with the order which holds in the heavenly bodes, while virtue is relevant with the disorder of the things which are subject to birth. The first is perfect while the second is imperfect. [Aet. *De Vestutis Placitis*, II 7, 7 (D. 336, vermutlich Theophrast. im Poseidonios-Excerpt)].

The above are mentioned once again by Aetius: *The Pythagorean Philolaus places the fire in the center (for it is the Universe's focal point), secondly he places the Anticthron, then, our habitat, the Earth comes third, placed opposite [from the Anticthron] and moving in a circle, that being the reason for the beings of the Anticthron being invisible to the beings of the Earth. The ruling power of the Universe lies in the central fire, which God placed, like a keel, to base the foundation of the sphere that makes up the world*. [Aet. III 11, 3 (D. 337 from Theophrastus)].

From all of the above we can sum up that, according to Philolaus, everything in "Olympus" and the "Cosmos" never changed, while in the areas up to the Moon, every being gifted with life was born, changed and finally died. The Earth and all the other planets were rotating around Hestia with the same direction but at different levels and with different speeds. Hestia was invisible because it shed its light to the antipodes of the Earth, which were impossible to get to. The Sun did not have its own light, but accepted and accumulated the sun of Hestia.

Philolaus, through his questioning of the traditional geocentric cosmology, set the foreground for Aristarchus' heliocentric theory, which would clearly dispute the central role of our small planet in the Universe. Even though he did not specifically place the Sun in the center, the idea of the "central fire" certainly served as a basis for the heliocentric theory. Stavros Plakides (1983-1990), a late Greek professor of Astronomy at the University of Athens, speculated that Philolaus, after having experienced the violence in southern Italy, avoided placing the Sun in the center of the Universe. Fear for his life may have been the motive for adopting the milder approach of placing the "central fire" instead (Plakides, 1974).

Diogenes Laertius, an important source from which we draw the views of Philolaus, mentions that opinions were divided as to who claimed first that the Earth is indeed moving: *It is told that he [Philolaus] was the first to claim that the Earth moves in a circle, while others ascribe it to Ictas of Syracuse* [Diog. Laert. *Lives of Eminent Philosophers* VIII, 84, 85)].

Aetius, another source, informs us that concerning the motion of the Earth Philolaus taught the following: *Others believe that the Earth is immobile. Philolaus on the contrary, believes that the earth is moving in a circle around the fire, tracing a tilted circle, just like the Sun and the Moon does* [Aet. *De Vestutis Placitis* III, 13, 1. 2. (D 378)]. Therefore, Philolaus came at a disagreement with his master, and taught that the earth was not immobile in the center of the world, but was circling the "Central Fire".

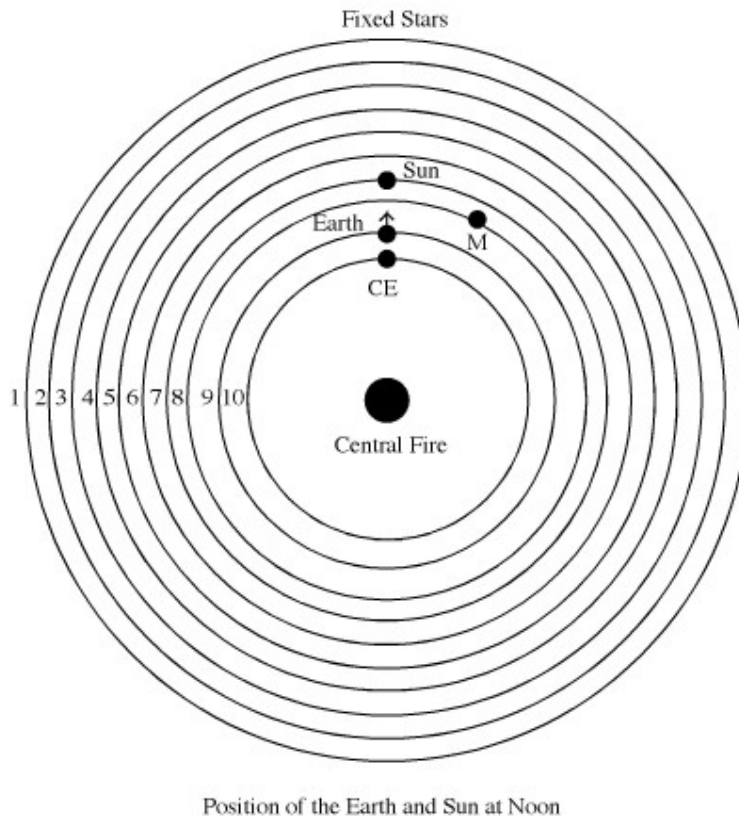


Fig. 5. The world view of Philolaus. In the world view of Philolaus, the center is occupied by the Central Fire, Antichthon (Counter-Earth, CE), The Earth, the Moon (M), the Sun, and beyond those lie the spheres of the five planets and that of the fixed stars. The crystalline spheres around the Central Fire are 10 ($= 1+2+3+4$), equal to the sum of the first four numbers.

Diogenes Laertius also informs us that Plato bought a copy of the work of Philolaus for the -astronomical at its time- price of 100 mnae: *Some authorities, amongst them Satyrus, say that he wrote to Dion in Sicily instructing him to purchase three Pythagorean books from Philolaus for 100 mnae* [Diog. Laertius, *Lives of Eminent Philosophers*, III 9].

Plato, according to Plutarch, studied the work of Philolaus carefully, and after careful reading, nearing the end of his days -as the story goes by- was convinced that the Earth is indeed moving around the Sun: *As Theophrastus informs us, Plato, near the end of his days had regrets for his older opinion, by which he unfittingly placed the Earth at the center of the Universe* [*Platonicae Quaestiones* H1 915, vol. XIII1, 76-78]. The study of Philolaus may have

been the reason for another change in the views of Plato: In *Republic* he identifies the celestial equator with the ecliptic, an idea which he turns from in *Timaeus*.

Aristotle, in his book *On the Heavens (De Caelo)*, provided us with some commentary on a few pythagorean views: *These affirm that the center is occupied by fire and that the Earth is one of the stars, and creates night and day as it travels in a circle about the center* [Aristotle, *On the Heavens* B, 13, 293a, 21-23]. Also, *The Pythagoreans make a further point. Because the most important part of the Universe -which is the center- ought more than any to be guarded, they call the fire which occupies this place the Watch-tower of Zeus, as if it were the center in an unambiguous sense, being at the same time the geometrical center and the natural center of the thing itself. . . For this reason there is no need for them to be alarmed about the universe, nor to call in a guard for its mathematical center; they ought rather to consider what sort of thing the true center is, and what is its natural place* [Aristotle, *On the Heavens* B, 13, 293b, 1-10].

The late professor of Astronomy at the University of Athens Demetrios Cotsakis (1976) mentions that the creation of the world-view which Philolaus describes was indeed revolutionary for the scientific thought of the time. He specifically mentions the views of the Italian astronomer Giovanni Schiaparelli (1835-1910), who wrote, as cited in Cotsakis (1976), the following, concerning the views of the Pythagoreans and the system proposed by Philolaus: *The system of Philolaus was not a fruit of some restless imagination, but came through the torque and pull of one who sets the outcomes of observation in accordance with a predetermined principle, which exists above the nature of things. . . Appreciating this, and combining it to the fundamental theorems of the Pythagorean Philosophy, the system of Philolaus naturally appears as one of the most wonderful creations of human genius. His critics are incapable of appreciating the power of research, which was necessary, in order to unify the ideas of the roundness of the Earth, its levitation in space, and its motion. Indeed, without these ideas, there would have been no Copernicus, neither Kepler, nor Galileo or Newton* [Cotsakis, 1976, p. 30].

2.2 The views of Ictas, Ecphantus and Heraclides of Pontus

Beyond the theories of Philolaus of Croton, there were other students of Pythagoras which put forward novel ideas, like Ictas and Ecphantus of Syracuse as well as Heraclides of Pontus.

Ictas of Syracuse claimed that the Heaven, the Sun, the Moon and the stars were immobile, and the only thing that moved was the Earth. Concerning his views, Cicero mentions the following: *As Theophrastus says, Ictas of Syracuse was of the opinion that the heaven, the Sun, the moon and the stars (i.e. the planets) and all that is high above are immobile, and nothing in the world is moving, apart from the Earth. But as it rotates around its axis with the greatest possible speed, its motion causes all these phenomena to appear, which would have appeared were the Earth immobile and heaven rotated instead of it* [Cicero, *Academica priora* II, xxxix, 123].

It appears that this theory was embraced by both Ecphantus and Heraclides as well, both of which believed that the Earth moves rotating in space, just like a wheel does around its axis.

Therefore, the students of Pythagoras were the ones to reduce our planet to its real place and motions, while at the same time holding a pyrocentric planetary theory, which certainly assisted Aristarchus of Samos (310-230 B.C) to formulate his novel heliocentric theory.

According to Hippolytus, the Pythagorean Ecphantus appears to have also followed an "atomic theory" of Pythagorean inspiration, by "giving body" to units, which were directed and governed by some divine force, "nous" (the mind). He also mentions that Ecphantus believed that the Earth spins around its axis with an eastern direction, but does not change its place in space. [Hippolytus *Refutationis Omnium Haeresium* I 15 (D. 566W. 28)]. These last two pieces of information are also mentioned by the doxographer Aetius, who finds Heraclides in agreement with Ecphantus. [Aet. *De Vetustis Placitis*, III, 13, 3 (D. 378)].

Heraclides in particular appears to have modified the atomic theory of Leucippus and Democritus, proposing that the first material elements were molecules and not atoms. According to him, the universe was composed of small material molecules which did not share any connection.

3 The views of other Philosophers

3.1 Anaximander and Seleucus

So far we have mentioned the views of the Pythagoreans concerning the motion of the Earth. However, even before the Pythagoreans, during the 6th century B.C., the great philosopher Anaximander, was most likely the first Greek astronomer to talk about the motion of our planet around the center of the world, which may have been the Sun. He also discovered other fundamental astronomical facts, like the "detachment" of the Earth, and its axial rotation. This information can be found in the work "*Expositio rerum mathematicarum ad legendum Platonem utilium*" of Theon Smyrnaus (70-135 B.C.), who lived during the reign of emperor Adrian (Theon of Smyrna, 1979).

Anaximander's views were adopted by later philosophers like Empedocles of Agrigentum (490-430 B.C.), Parmenides of Elea (early 5th century B.C.), Aristarchus of Samos, Cleomedes (2nd or 3rd century B.C.) and several Pythagoreans.

Another philosopher, which name is Seleucus of Seleucia (c. 2nd century B.C.), was an astronomer of the hellenistic period from Anatolia, who supported a heliocentric theory of his own. Fragments of his work are found in the works of Plutarch, Strabo, Aetius and Hippolytus. Hippolytus informs us that the Earth was indeed moving, and that the Moon played a part in its axial rotation as well as in its orbit around the Sun. [*Philosophoumena*, Book C, 897C, 14-16]. The same source also informs us that he believed that the Cosmos was infinite [*Philosophoumena*, Book ?, 886C, 6].

Plutarch mentions a few of his other astronomical ideas [*Platonicae Quaestiones* H1 915, vol. XIII1, 76-78]; unfortunately, all of the work of Seleucus was lost and we have no knowledge of his heliocentric theory.

3.2 Aristarchus of Samos

After the Pythagoreans, appeared the great astronomer Aristarchus of Samos (310-230 B.C.), the foremost introducer of the heliocentric theory as we know from the book of Archimedes *Arenarius* [I 4-6 (3, 180-182), manuscript 2, Cod. Laurent. Gr. 28]. Plutarch, also, writes about the heliocentric theory of Aristarchus of Samos [*De placitis philosophorum* II, 24 (7, 355a)].

Aristarchus' hypothesis was original and quite bold for its time. For this reason Plutarch mentions that he was accused of atheism [*De facie in orbe lunae*, 923A (15, vol. XII, p. 54)]. Aristarchus, according to Aetius was helped to escape in Alexandria by his teacher Straton of Lampsacus (Aetius, *Placitorum Compositione* book 7, 313b, 16-17).

It is apparent that apart from the fervent geocentrists, there were several Greek thinkers whose philosophical thoughts disputed the validity of the geocentric system.

Unfortunately, overcoming the objections of the heliocentrists, the geocentric system, as was formulated by Claudius Ptolemy (2nd century A.D.), reigned for centuries, seconded by the weight of the views of Aristotle, whose work was held as indisputable during the Dark Ages.

4 Emperor Julian

Yet faith in the heliocentric system had not been forsaken. During the 4th century A.D. emperor Julian (336-363 A.D.) studied with care the works of the ancient Greek philosophers, which he held in deep respect. His studies took place in the philosophical schools of Athens. Enchanted by the beauty of the ancient Greek spirit, he wished to revitalize it. He believed that the Earth's world order was influenced by a heavenly and divine hierarchy, in which everything originated from the unique God, the illuminating Sun.

He was interested in philosophy as well as astronomy, and rose as a fervent supporter of the heliocentric system. In his book *Hymn to King Helios* dedicated to Sallust (*Hymn to the king Sun dedicated to Sallust*), he writes: *For that the planets dance about him as their king, in certain intervals, fired in relation to him, and revolve in a circle with perfect accord, making certain halts, and pursuing to and from their orbit, as those who are learned in the study of the spheres call their visible motions; and that the light of the moon waxes and wanes varying in proportion to its distance from the Sun, is I think, clear to all* [*Hymn to King Helios dedicated to Sallust*, 135b, 1-6].

Therefore, Julian held the Earth as a planet, which revolved in a circular orbit around the Sun. The Earth is moving, and along with it the other planets in circular orbits around the Sun, in determined intervals i.e. constant distances. The above clearly show that the theory of Aristarchus hadn't been forgotten, but during the 4th century A.D. enjoyed advocacy.

Conclusion

Beyond the sperms of the heliocentric theory that we saw in the Orphic Hymns, several scholars of Ancient Greece supported this "heretical" for its time view. Its main introducers were the Pythagorean philosophers Philolaus, Ictetas, Ecphantus, Heraclides and foremost Aristarchus of Samos, who gave the Sun its rightful place in the Pythagorean "central fire".

The heliocentric theory did not prevail, and instead, the geocentric model, elaborated by the great astronomer Claudius Ptolemy, reigned for centuries in the West, since the undisputed Aristotle was in agreement with it.

Yet the heliocentric theory had not perished, since in the 4th century A.D. the Emperor Julian, a believer in the divinity of the Sun, became a fervent supporter. In the end, the heliocentric system faded away until the 16th century when the great Polish clergyman and astronomer Mikolaj Kopernik (Nicolaus Copernicus 1473-1543 A.D.), brought it back to light (Copernicus, 1995). The hypotheses of Aristarchus of Samos and the preparation of the Pythagoreans were the foundations for the great Polish astronomer's thoughts.

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